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ADVANCEMENT IN THE SCIENCE OF PUBLIC HEALTH*

BY

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The public health movement is still very young. Compared in age with such institutions as the church, the monetary system and the military, public health service is at best only a youth. Like a healthy, vigorous human, the public health movement has grown rapidly during its early life.

Within the first year of life a healthy infant doubles in weight. Then he settles down to a less rapid but steady increase in height and weight until about twelve years of age. At that, as though the youngster had just seized upon a glimpse of the richness of life and the rare privileges of human existence upon the earth, he begins to grow in height and weight and in breadth of intellect and vision at a rate far beyond any previous experience since the first twelve months. During about four years of that period known as adolescence, a child grows with such amazing rapidity that his parents are taxed to the limit to keep him supplied with clothes that fit, food that meets his needs and a thousand things which are required to satisfy his expanding physical and mental horizon. It requires, furthermore, the closest observation on the part of acquaintances and friends of the family to recognize and keep informed about the changes that take place in growth and habits of an adolescent.

It appears that the public health movement is now in the midst of its adolescent growing period. During its infancy, the period prior to 1900, it suffered from inanition. Having survived that hazardous and critical period, the public health movement then settled down to a reasonably steady growth that continued until about the opening of the World War. That conflict gave a tremendous impetus to public health service. It demonstrated on a large scale the infinite possibilities of controlling disease and maintaining health through the application of scientific knowledge. Since then the growth of public health service in this country has been phenomenal. It has enjoyed a healthy adolescence, expanding and spreading out in all directions. The results have been astonishing. A study of appropriations by municipal and state legislative bodies indicates that this youthful activity may suffer somewhat from a lack of nourishment during the immediate future. It requires more than a short ration, however, to seriously discourage a robust adolescent.

An omnivorous appetite is characteristic of youth. Food in great quantities for body and mind is drawn from a multiplicity of sources if healthy development results. So it is with the public health movement. No one science and no one profession can provide this service with a program

* Read before the Twenty-sixth Annual Meeting, Illinois State Academy of Science, East St. Louis, Illinois, May 5, 1933.

worthy of the name. Indeed, public health work depends upon knowledge and skill drawn from the fields of medicine, engineering, bacteriology, epidemiology, biometry, biology, zoology, geology, psychology, psychiatry, sociology, chemistry, dentistry, eugenics, physics, nutrition, education and numerous others. Advancement in any of these fields is at least a potential advancement in the public health movement. A delineation of advancement in public health must therefore be limited to a broad vision of progress along the whole sweeping front of this significant movement. So able a scientist as Dr. H. Levy, the mathematician, declares that no scientist would claim to know all about tobacco-growing, let alone the other factors that enter into the manufacture of a cigarette. How much less would an administrator profess to know all about all of the sciences involved in public health.

The most important advancement in respect to public health is doubtless the change in popular attitude toward the meaning and significance of this movement. Only 27 years ago an impetuous president of the United States entertained grave doubts in his own mind as to whether or not he should retain as chief sanitary officer of the Panama Canal Zone a man who spent, as he had been informed, all of his time in trying to kill mosquitoes. About two weeks ago a nationally known educator (Dr. Robert K. Speers) roundly upbraided health education instructors for being too gullible in the acceptance of fads and half truths. Among these he cited "a clean tooth never decays" and "a daily bath for positive health" as examples.

These two illustrations show that within thirty years the best popular attitude has changed from skeptical to critical in respect to preventive medicine. From the mountain peaks to which he has swiftly climbed the well informed public health specialist looks back upon the valley of limited knowledge that he used as stepping stones to higher altitudes. The knowledge he used for tools then, he now recognizes were crude and simple. These tools served well their purpose, however. Now the public has reached those valleys and are already striving to climb the higher grades. This is proved by the critical attitude of mind.

The shift from skepticism to confidence in preventive medicine made possible the improvement that has taken place in the public health. It made possible appropriations to health departments and contributions to the many voluntary public health agencies throughout the country.

The next step, according to J. B. S. Haldane, is to bring about a popular attitude so that both the electorate and the lawmakers will think in terms of human biology. Popular thought today is almost wholly in economic channels. Tariff walls are built up and torn down chiefly for economic reasons. If thought were redirected into biological channels the basis for tariff and other laws would shift to human instead of monetary values. Suppose the steel industry petitioned Congress for a protective tariff. The death rate from pneumonia is much higher among steel workers, particularly those subjected to strenuous labor and radical changes in temperature, than among employes in any other industry. With this knowledge at hand the biologist-politicians would say to the steel magnates, "We cannot protect your industry until you protect more adequately the health of your employes."

Lead poisoning, silicosis, and asbestosis are three important hazards involved in various manufacturing, industrial, and commercial employment. The lawmakers who think in terms of human biology would grant no favors in the form of protective tariffs or other legal advantages to any of these industries until all reasonable precautions were taken to protect the employes. This is the next great step in the advancement of public health. The prevailing popular tendency to criticize the shortcomings of health education encourages the belief that progress is being made in that direction.

Record Keeping

Next to the change in popular attitude toward preventive medicine the next most important advance in public health service is probably the collection, classification, and utilization of records. It is an astonishing fact that reliable records of mortality, the prevalence of diseases and of births date back only to 1918 in Illinois. Prior to that time the mortality records in only 27 states were acceptable to the United States bureau of the census as reliable. Mortality records are now accepted by the bureau from all of the states except Texas and South Dakota. These records, which are constantly being more refined and accurately executed, are the very foundations upon which the public health structure is built. They show what diseases are most hazardous, what age groups fall victims most easily to this or that danger. They show the results of efforts at disease control and the gains and losses in the public health program. We know from the death records, for example, that diphtheria killed one thousand, one hundred forty-two people in Illinois during 1918 and only two hundred forty last year. We know that mortality from tuberculosis fell from 8,579 in 1918 to 4,273 in 1932. We know also that the greatest risk of diphtheria is to the child between two and five years of age while the hazard of tuberculosis is three times as great as that from all other health dangers to young women between 14 and 35 years of age.

The statistics, moreover, show that improvement in public health protection has advanced at an uneven rate from a geographical standpoint. This is true when considered on a state, national or international basis. Smallpox, typhoid fever and malaria are as prevalent and fatal as ever throughout a large portion of Mexico. Within the United States both typhoid fever and diphtheria have been practically eradicated in some commonwealths while in others these two diseases are still problems of large magnitude. Last year, for instance, typhoid fever was responsible for only 1 death or less per 100,000 people in New York, Connecticut and Wisconsin, while diphtheria was charged with less than 3 deaths per 100,000 people in California, Iowa, Massachusetts, Michigan, Minnesota, New York and Wisconsin.

In Illinois two counties last year experienced death rates from diphtheria of a magnitude comparable with those prior to the discovery of antitoxin and toxoid or toxin-antitoxin while 58 counties suffered no loss of life whatever from that disease. When grouped together the 34 counties that make up the extreme southern third of Illinois have a mortality rate from typhoid fever that is fifteen times greater than that of the 33 counties in the extreme northern third of the State. The death rate from diphtheria is three times as great, and the infant death rate is 30 per cent higher in the southern than in the northern third of this State. In the southern third the death rate from tuberculosis is 20 per cent greater than in the central third.

Statistical records bring out, moreover, that a tremendous shift is taking place in the age level of the population. At the turn of the century nearly one-half of all mortality was among children under five years old. Now less than 10 per cent of the mortality is in that age group. This means that a much larger percentage of the population is reaching maturity and the upper age levels than at any previous time in history. Fully 40 per cent of the population of Illinois are over 35 years old now whereas about 30 per cent of the people in the State had reached that age in 1900.

This aging of the population brings to the fore a host of problems. Instead of diarrhea, diphtheria, typhoid fever, tuberculosis and other hazards of infancy, childhood and early maturity, such health risks as cancer, heart disease, diabetes and nephritis dominate the picture. In addition to this, industry, commerce, and the government find themselves with an increasingly large percentage of leaders who have reached three score years of age. Al-

though still physically vigorous and mentally alert these men experience great difficulty in adjusting their point of view to the swiftly changing conditions brought about by scientific development. The records at least make us aware of a problem that grows daily in complexity and magnitude.

Sickness records have likewise marked an important advance in public health service. Not only are case reports required for a constantly increasing number of diseases but sickness surveys have brought to light some astonishing knowledge. No one suspected until recently, for instance, that chronic rheumatism is the greatest single cause of all chronic illness. This opinion is based upon a study of one per cent of the population of Massachusetts which indicated that fully 145,000 people are suffering from chronic rheumatism at any one time in that state. The Committee on the Cost of Medical Care brought together a mass of valuable records in respect to the prevalence and cost of sickness and medical care.

Activities which stimulate the collection and study of records constitute a tremendous contribution to the advancement of public health. They point the way toward better adjustment in a rapidly changing world.

Mental health is by all odds the most important problem of the future. Advancement in application of mental hygiene has not progressed very far but there has been a tremendous growth in knowledge concerning this subject on the one hand and a recognition of the problem on the other.

The sheer magnitude of the problem compels serious thought and stirs up apprehensions. Nearly one-half million hospital beds in the United States are filled with nervous and mental patients. The ratio of feebleminded and epileptic patients per 10,000 people in the United States has increased from 2 to 5 since 1904. In Illinois the patients in State hospitals for the mentally defective (insane, feebleminded and epileptic) have increased from 27 to 40 per 10,000 population since 1914. While the entire population increased 30 per cent the institution population increased 48 per cent. The actual number of mental defectives under the care of the State has increased from 16,402 in 1914 to 31,367 on the first of April of this year.

Turner points out that more children are headed for the insane asylum at the present rate of commitment than for college. Birth reports filed by the Illinois State Department of Public Health show that reproduction among the best stock has declined far more rapidly than among the less desirable. The number of children born to mothers of mental defective and retardates is almost twice the number born to mothers of children who are sufficiently intelligent to attend high school and college.

Statistical studies indicate that about 11 per cent of the feebleminded in any generation come from the mating of feebleminded parents while 89 per cent come from the mating of carriers. The latter are people, who though normal themselves, carry over to their offspring the mental defect. This is an illustration with the Mendelian recessive type.

Another phase of the mental health problem is that of maladjustment. Mental illness is frequently functional rather than pathological. Bad training and lack of adjustment to modern conditions can destroy usefulness as completely as biological incapacity. Fully 40 per cent of the crime in this country is committed, according to newspaper reports, by boys under 25 years old. Perhaps three-fourths of these youngsters have sound minds biologically. They are badly trained.

These are disquieting symptoms. They constitute a distinct advancement in public health if they stimulate action in the right direction. The extension of sound eugenics, programs and the employment of psychiatry in our schools are the ways in which to attack the problem. The great store of technical knowledge that makes possible the maintenance of community and individual health at a high favorable level depends upon an intelligence high enough to apply the knowledge.

Technical Advancement

Recent advances in the field of nutrition and food values are voluminous and remarkable. These relate principally to the vitamins. Probably the most far reaching development is the perfection of a method for impregnating milk with vitamin D. This can be done economically and practically in three ways. The fluid milk may be irradiated with ultra-violet rays from a carbon arc lamp, the cows may be irradiated in this way, or yeast may be added to the ration of the dairy herd.

These processes yield a milk that has a high anti-rachitic value. It will prevent rickets in babies and children who have no cod liver oil or other vitamin D concentrate. Even when less than a quart per day is given the children show no more evidence of rickets than do those under the care of competent pediatricians who prescribe cod liver oil or other anti-rachitic preparations.

The cost of irradiating milk by the carbon arc lamp is above 15 cents per 100 gallons under quantity production methods. Thus an economical method capable of almost universal application has been opened up for the control of rickets. Advantage of the opportunity has been seized upon by forward looking dairymen, especially in New England where anti-rachitic milk is a regular market product.

Perhaps the newest trend of thought in the field of nutrition is that a balanced ration of vitamins is required to yield satisfactory results. Thus a concentrate of vitamin A, for example, would not produce the desired results unless the patient has a proportionate volume of vitamin B, vitamin C, etc.

Another refinement of knowledge in this field is a recognition of the fact that humans are born iron-rich and calcium poor. This is a natural condition which has, as Sherman points out, important survival value but it creates a health problem that must be solved by the intelligent use of artificial methods. Poverty of calcium makes the bones of an infant at birth much softer and more pliable than those of an adult. This reduces the hazards of birth to both infant and mother. It also reduces the chances of acquiring sound, durable teeth and sturdy bones. This deficiency must be met by a dietary regimen rich in calcium and phosphorus.

Early this year the Agnews announced that they had succeeded in controlling caries by adding vitamin D and phosphorus to the diet. During recent years Mrs. Mellanly reported that pyorrhea could be produced or prevented at will in puppies by withholding or giving vitamin D in appropriate quantities.

These fragmentary references suggest how rapid have been the advances in the knowledge of nutrition and food values during the last decade or two and indicate the importance which diet is assuming in respect to public health.

Refinement of technique and the adjustment of old ideas to meet new situations has marked the practical advancement in immunology and epidemiology. Knowledge has reached the point where practically all of the gross disadvantages of quarantine can be eliminated under ideal circumstances. With an adequate health service, for instance, it would not be necessary to quarantine at home or prohibit from school the children who have been exposed to measles until the ninth day after exposure. In the face of a scarlet fever outbreak it is a more scientific course to keep open the schools under medical supervision than to close them. The isolation of patients suffering from communicable diseases is now considered a measure that results more in benefit to the patient than in protection of the public.

Under prevailing conditions the carrier is now recognized as a more important source of infection to others than bedfast patients.

Of outstanding importance because of the magnitude of the problem is the refinement of epidemiological methods concerning tuberculosis. The skin test which shows whether or not a person has been infected, together with x-ray pictures of the chest, make possible the almost complete control of this disease. The procedure is based upon the principle that no person can have tuberculosis without being infected with the tubercle bacilli. An individual might slowly starve to death or gradually waste away on stale air and a shortage of sunshine but he would never suffer from tuberculosis unless the germs of that disease get into his body. The source of those germs, moreover, is nearly always a human being. The skin test shows whether or not the tubercle bacilli have gained access to the body.

Children under school age have a narrow range of human contacts. Opportunity of infection is limited to family members, servants, close friends and perhaps nursery school and kindergarten teachers. Thus a positive tuberculin test on a young child indicates a nearby source of infection. Meyers points out that 60 nursery school children were tested under his observation. The test was positive on four children. A search for the source led to the discovery that one of the teachers was tuberculous. Her removal saved the other children from infection. In Massachusetts the source of infection of school children is found to be a member of the family in more than one-half of all cases. Frequently these sources of infection are people who do not know that they are tuberculous. They are all the more dangerous for that reason.

A positive tuberculin test indicates infection only. It does not necessarily mean active disease. Indeed, only about 1 in each 100 children with positive tests is found to be suffering from the disease. Diagnosis in these early and minimal cases can be established only by the x-ray.

This refinement in procedure with respect to tuberculosis must be rated as one of the larger advancements in public health service. It has great potentialities. Tuberculosis still heads the list of fatal communicable diseases with the possible exception of pneumonia.

Methods of scarlet fever control have reached a point of advancement which makes practicable the complete elimination of this disease from institution populations. At least two Illinois schools, that at Mooseheart with an enrollment of some 1,500 and the soldiers' orphans school at Normal with about 700 have succeeded in eradicating scarlet fever. All children are given the Dick susceptibility test. Those who show a positive reaction are given a series of immunizing doses of scarlet fever toxin. A similar course was followed before it closed, a victim of the depression, by the Durant Hospital for Contagious Diseases in respect to candidates for training as nurses. Experience in all three places showed that the test is thoroughly reliable as an index to susceptibility or immunity. In no case did any pupil or nurse who had been vaccinated and thereafter showed a negative Dick test experience an attack of scarlet fever. All three institutions remained practically free from the disease over a period of years although scarlet fever was frequently epidemic in the communities round about.

While it seems impracticable to attempt general vaccination against scarlet fever in the way employed with respect to diphtheria and smallpox, the use of the Dick test might be employed to great advantage especially among school children in the lower grades. The Dick test applied to school children in the fall would show which ones are susceptible. Not more than one-third would fall into this group and they would be mostly in the lower grades. If scarlet fever appeared in the community during the year all

efforts at control could be concentrated on the susceptibles. Even in the face of an epidemic the use of the Dick test and the observation of susceptible children is a far more scientific, practicable and economical procedure than closing the schools.

A particularly promising advancement is the development of serum treatment for patients with lobar pneumonia. An experimental demonstration of this procedure has been underway in Massachusetts since 1931. Progress reports indicate that serum treatment, when given to patients suffering from types I and II prior to the fourth day of the disease, reduces mortality to about one-third of that in non-serum treated patients. This trial in Massachusetts is being observed with the greatest interest. Lobar pneumonia of types I and II is the form which the disease most frequently takes among young and middle aged adults. The perfection of the serum treatment method would be of the greatest significance to public health. Pneumonia usually ranks second or third among the leading causes of death in Illinois. Importance of control is therefore manifest.

Very recently Sauer has reported significant success in preventing whooping cough by vaccination. He used a vaccine prepared under his own direction. A fairly large number of vaccinated children who were undoubtedly exposed to repeated infection escaped sickness entirely. While the procedure may be regarded as still experimental it undoubtedly has value and can be utilized by experts to advantage.

Health problems associated with industry have come to the fore very rapidly in recent years. To cope with these medical knowledge has progressed as rapidly as the need has manifested itself and more rapidly than it has been applied. The McCord test for lead poisoning, for example, seems to be a reliable means for controlling that growing hazard. Some people are much more susceptible to lead poisoning than others. More and more manufacturing processes involve an exposure of employes to this risk.

The McCord test indicates by changes in the blood whether or not an individual exposed to the danger is reacting unfavorably to the risk. Blood changes pointing toward disabling illness can be observed long before definite clinical symptoms of poisoning manifest themselves. The McCord test is, therefore, of significant value in controlling lead poisoning among employes.

The medical examination of candidates for employment in various occupations has become routine practice in a number of industries. These include railroads, bus companies, steel corporations, aeronautics and many of the public services such as policemen, firemen, military, etc. This precaution is a service to both the employes, the public and the industry concerned. Individuals of unstable nervous systems and those with disqualifying physical defects are in this way prevented from undertaking functions that might endanger both themselves and others.

A substantial number of industries have created medical departments through which the growing volume of knowledge concerning industrial hazards are applied. On the other hand, there is room for great expansion in this direction. The chief problem concerns small industrial units. In some localities, as in Philadelphia, this situation has been met through the organization of a medical group the cost of which is pro rated among the industries served on the basis of employe population.

In the field of sanitary engineering the methods of sewage disposal have progressed to the point where it is possible to obtain from the outlet of sewage treatment plants clear, sparkling water that is perfectly purified and safe for drinking. Our esthetic sense would doubtless rebel at drinking water obtained from that source but the sanitary quality of the water is unquestioned.

This sketchy outline of the more noticeable developments and trends in the public health field suggest how rapidly knowledge of a practicable character has come to light. Advancement has taken place along the whole broad front. The gains in end results have been solid and durable. This is proved by the fact that health conditions have been maintained at unusually favorable levels throughout the current economic depression. Under the pressure of prevailing financial conditions no scandals of consequence have come to light in health departments.

These are significant observations. The public health movement is built upon solid ground. Its achievements are a monumental tribute to scientific thought. The methods employed in extending its benefits are a beacon to guide activities in other departments of life.

MEDICAL SCIENCE, ITS PAST, PRESENT AND FUTURE*

BY

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In agreeing to speak upon this subject I accepted a large order, but I assure you that I have never entertained serious notions of filling it. In these days when defaults are so common on everything from such trivialities as teachers' salaries to such important things as bankers' dividends, I felt sure that I would not be held strictly to my bargain. What I really propose to do is to touch some of the high points of medical history, recent and remote, germane to my theme, which might perhaps better be stated as "The Road to Medical Progress".

The art of medicine had its beginnings in the earliest dawning of human development, since the practice of medicine is the inevitable consequence of the existence of disease. It is natural that the attempt to practice the art should be as old as man, since disease in general is not a special product of civilization but is an integral part of the picture of life from its earliest beginnings. The earliest man had the problem of illness to beset him, according to evidence from fossil and other relics. Studies of the pathology of the remains of our remote ancestors are largely confined to those aspects of disease which are apparent from changes in the bony framework of the body and the teeth. The fossil remnants of some of our earliest men give clear evidence of the prevalence of disease of various types. For example, the Rhodesian man found at Broken Hill, which seems to be dated as early Pleistocene or late Pliocene, according to Dr. Hooton, shows, among the fifteen teeth which were found, ten with rather characteristic dental caries. The surrounding bone changes gave indication that there were alveolar abscesses. In the femur which was found with this skull there were abnormalities characteristic of rheumatism. And in the skull itself there is also a peculiar perforation about one-fourth inch in diameter in front of the orifice of the left ear indicating a discharging abscess. In this man one sees the same sort of picture of disease that is prevalent today. His tooth decay could scarcely have been due to abuse of cooked and prepared soft foods, for he lived somewhat prior to the era of oatmeal and corn meal mush. He lived on nuts, raw meat, crude cereals and fresh greens, if evidence from other sources does not lead us astray. But he suffered from the same sort of illness that our more pampered civilization finds itself heir to.

When primitive man began to think about the ways of combating disease in himself, his methods were those of the empiricist. He tried one and another of the means that occurred to him in attempting to rid himself of pain and weakness, and to forestall the death which he had seen his fellows suffer under similar circumstances. Whether his first approach to therapy was through an appeal to mysticism and to the supernatural by the medium of the witch doctor, or whether his earliest attempts were by the

* Presented before the Twenty-sixth Annual Meeting of the Illinois State Academy of Science, East St. Louis, Illinois, May 5, 1933.

use of herbs and strange concoctions of rare and oftentimes repulsive substances, one can only speculate. This much is certain, that he struggled with this meagre grasp of the facts to find a remedy for his ills whether it was through incantation or medication. What the earliest man lacked was not a desire to be healed or the willingness to use his best reasoning in finding a way to be healed. Rather it was a dearth, or one might say total absence, of knowledge concerning the causes of disease that frustrated him in his attempts at cure.

Furthermore, the methods employed in attempting to solve the problems of disease and its treatment were not promising. The attempt to cure disease without a knowledge of its cause could scarcely be called scientific. Healers became known as fakirs because of the obvious chicanery and fraud which they practiced. The spirit healers and the witch doctors inevitably failed except when the real nature of the complaint of their patient was nervous and could be affected by the emotional state of the individual. So too, after the herb doctor by trial and error found amongst the plants certain ones which had powerful effects upon the animals or men who happened to eat them, he discovered to his sorrow that for the most part his potions were fruitless. The art of healing in the absence of knowledge of the cause of disease was as apt to be productive of results as the search for the needle in the hay stack. In the almost infinite complexity of types of disease and the equally great variety of procedures for their control or cure the likelihood that by random chance successful measures would be happened upon is extremely small.

The science of medicine may be said to have begun when man began to accumulate knowledge concerning the intimate mechanism of disease, and to try to apply that knowledge to the search for ways and means of curing it. There is no date in history that one can set as the beginning of medical science, because it began very gradually. Knowledge applied to medicine did not become important, however, until late in the recorded history of human civilization, and in truth one may say that a really producitve medical science dates only from the Renaissance. The early Egyptian civilization gives definite evidence of an attempt having been made to study human disease by somewhat exact methods. The Greeks made further progress, but not until after the end of the Middle Ages can it be said that any notable applications were made of the knowledge of physiology and pathology to the treatment of disease. This is largely due to the fact that not until the rebirth of learning in recent times has there been widespread use of the experimental method in biological science.

What are the exact methods by which progress has been achieved in the medical sciences in recent times? How has the treatment for thyroid disorders been discovered? How were the methods developed for the control of Addison's disease, diabetes mellitus, diabetes insipidus, pernicious anemia, syphilis, small pox, diphtheria, to mention only a few of the many diseases with which medical science is now able to cope? I should like to be allowed to sketch hastily the methods by which several important discoveries were achieved. A recent discovery about which nearly everyone knows, is that of insulin for the control of the metabolic disorder, diabetes mellitus. Most of you know that Frederick Banting and J. J. R. McLeod were awarded the Nobel prize for the discovery of insulin, but probably few know how it came to be discovered. Banting and McLeod are credited with this achievement, and they were not, to be sure, without great merit for the part they played in it; but they are no more solely responsible for it than it was "the medical corps that won the war". About a half century before Banting, McLeod and their co-workers put the finishing touches on the job,

Minkowski and von Mering found that removing the pancreas from animals produced diabetes. The story is told that these experimenters came upon this knowledge by accident. They had removed the pancreas from animals for another reason and noticed by chance that insects were unusually attracted to the urine of these animals, which they found on examination contained great quantities of sugar. For the next forty years workers tried to extract a substance from the pancreas which would control diabetes. Time after time the attempts failed, largely because the pancreas also produces in great quantity the proteolytic enzyme trypsin which is extremely toxic to living matter. Then one day a young pathologist at the University of Minnesota, whose name I feel rather sure you have not heard in this connection, Dr. Barron, found that by ligating the external secretory duct of the pancreas and allowing the animal to recover, all the enzyme secreting cells degenerated and left only the cells in the islets of Langerhans. Since no diabetes resulted it became apparent that these islet cells elaborated the substances necessary for proper carbohydrate metabolism. When Banting began to think about curing diabetes he knew of the discoveries of Minkowski and von Mering, and of Barron. He merely took the next step and with the help of a young graduate student whose name is now a household word, Charles Best, he made extracts of such islet tissue, which they found to their satisfaction were not too toxic to be used, and did control diabetes. But they were not chemists, and the problem of extracting the material, which they called insulin, from the islet tissue, was too intricate a problem for them to master completely. So they called in the biochemist J. B. Collip to complete the trick for them. And what did Professor McLeod do? Aside from accepting a share in the Nobel prize, history will record that he judiciously discouraged his ardent young assistants from expecting results too easily. The real story of insulin is a drama of scientific progress, of human foibles, and a beautiful illustration of the place of step by step progress of knowledge in the arrival at practical fruition of scientific results. Insulin required Minkowski and Mering, it needed Barron, McLeod, Banting, Best and Collip, to contribute their small part each to the sum total of scientific fact that now forms the basis for the treatment of diabetes.

Another important recent advance in applied medical science has been the development of our knowledge of the accessory food substances, or vitamins. The knowledge of vitamins had a romantic beginning, because the first definite evidence that substances important to nutrition were absent in certain diets, thought to be adequate with respect to the known nutritional requirements, came from observations of sailors making long voyages without supplies of fresh food. Some very interesting clinical observations were made on the relation of dietary inadequacies to the occurrence of beriberi in seamen. Beriberi is a disease of the peripheral nerves. Its victims become easily fatigued and depressed, their skin becomes sensitive, there is swelling and edema, and the mortality in the disease is very high. It was the scourge of seafaring men in the early days of ocean sailing and not until a scientific analysis of its cause had been made was its occurrence brought under control. Empirical methods of treatment instituted in the years around 1880 pointed the way for a thoroughgoing investigation of the problem, and today there is no longer any reason why sailors or others living upon highly refined and restricted diets need suffer from beriberi. The classical proof of the role of an accessory food substance or vitamin in this disease was made in 1897 by Eijkman, who was medical officer to a prison in Dutch Java. Beriberi was common in that prison and Eijkman noticed that the poultry which were fed on the garbage of the hospital died with a disease picture very similar to that of his own patients. He was therefore

led to investigate this problem thoroughly and fed pigeons some rice in the natural condition, with the husk on the grain, and others on rice from which the husk had been removed, but still retained the outer layer or silverskin, and the embryo or germ. Still others were fed on polished rice from which these latter parts had been removed. He found that all the pigeons fed on polished rice died of polyneuritis or beriberi, while those fed the whole grain or the grain still retaining the outer layer and the germ did not develop the disease. He therefore proved that the absence of the material removed in milling and polishing rice was responsible for the disease. He thought erroneously that it was the silverskin itself which contained the substance which protects against beriberi, whereas, as a matter of fact, we now know that this substance is in reality concentrated in the germ of the seed which he removed with it. His practical deduction, however, was correct, that rice polishings, when fed, protected against beriberi. At the time of his studies two-thirds of the people in the large cities of the East Indies suffered from beriberi. Among prisoners as many as eighty per cent showed symptoms of the disease in institutions where polished rice formed the main article of the diet. The disease has all but disappeared since unmilled rice has been substituted in institutions, and the incidence in the population at large is diminishing rapidly with the dissemination of popular information concerning the cause and cure of the disease.

The antiberiberi substance is now known as vitamin B. More recent work by McCollum and Hopkins showed that the lack of vitamin B causes a retardation of growth and it has been indicated by chemical studies that there are really at least two substances included in what was thought to be vitamin B, the absence of one of which leads to the human disease beriberi, another leads to inadequate growth, while a third may be related to the disease pellagra.

The development of knowledge concerning the vitamins presents a story of the application of the experimental method in biology and medicine which is scarcely excelled in any other instance. Knowledge has been acquired by painstaking observations of apparently inconsequential details. In these times when the scientific method as a whole has been attacked by persons in high places in academic life, it may not be amiss to point out that we would not have any of our important knowledge of the vitamins if scientists had disdained to spend months, and even years, of their lives studying carefully the minute details of the nutritional requirements of common laboratory animals.

The scientist has been accused of being anti-intellectual in that he places his reliance on observations rather than logic. If it is true that placing reliance on observed facts, instead of abstract logic, is anti-intellectual, then I, for one, wish to challenge the significance of the word intellectual. If intellectualism requires blindness to reality in subservience to logic, then certainly intellectualism is a sterile formula. I suspect that those persons who have criticized the experimental method as the sine qua non of progress in science have confused intellectualism with pedantic scholasticism. A further surmise may be permissible that the modern pedantics who rail at the "blizzards of facts" which modern science has contributed to knowledge, find themselves in a "state of bewilderment" because they themselves are incompetent to grasp the true meaning of the observations which experimental science has placed in the hands of humanity.

Nor is it a new complaint for scientists to hear that the experimental method is essentially anti-intellectual. The dark ages were full of such talk, and the rebirth of learning, with its general acceptance of the experimental method, did not in itself endow the entire human race with enough intelligence to be able to appreciate its significance.

The question may be asked as to why the use of the experimental method in biology has been so tardy in coming to fruition. In the biological sciences there are numerous serious difficulties standing in the way of experimentation. In the first place, analytical study requires the use of living animals and frequently requires that changes in their environment and their make-up must be produced in order to permit controlled observations of individual phenomena. In order to experiment on animals effectively, means had to be developed for producing anesthesia. Before the discovery of anesthetics, experimentation on animals was confined largely to those observations which could be performed without inflicting pain. It can truthfully be said that the advent of anesthesia was the greatest single advance ever made in the development of tools for biological research. It should be noted, in passing, that the development of anesthesia, which was itself a result of animal experimentation in pharmacology, was also one of the greatest boons to mankind directly that science has ever accomplished. For us to consider the practice of medicine and surgery today without the use of narcotics and anesthetics is to consider a practice so archaic as to be absurd. The possibility of safe anesthesia is undoubtedly as important to mankind as any other result of modern science.

After speaking at length of the importance of animal experimentation, it seems necessary to consider briefly the problem of the ethics of the use of animals in this way. Living in such a homocentric civilization as we do, it may seem to some that there could be no room for argument concerning the propriety of taking the lives of the lower animals for the furtherance of human welfare. Of course, in the history of mankind there seems never to have been any very strong sentiment against the use of animals for man's purposes. Long before animals were domesticated our savage ancestors employed animals of all sorts for their food, just as we, as a matter of fact, do to large extent today. In other words, man has collectively always felt justified in using the lower animals for his food, as his beasts of burden, and even, one may add, for his enjoyment in hunting, fishing, racing and fighting. It is a strange paradox that in our civiliation, which has never questioned the right of man to slaughter animals for his food and enslave them for his convenience, there should actually grow up a strong sentiment amongst a small minority against the use of animals for the furtherance of knowledge and of health. Surely there can be no logical grounds for denying the right of men to employ animals for the highest good known to man—that is the furtherance of knowledge, particularly in relation to problems of health—when the propriety of almost wanton destruction of animal life in hunting and fishing, to say nothing of the orderly business of slaughtering animals for human food, is accepted as correct. There are, as a matter of fact, many experimental biologists who are perfectly willing that animal life should be sacrificed for the real good of mankind in connection with the provision of food and with the increase in knowledge who are strenuously opposed to the destruction of animals by relatively cruel methods in hunting and fishing. It seems, to the mind of one who believes that scientific research in biology and medicine has been of great value to human welfare, that so long as the thesis that animals may be used for human welfare at all is maintained, there can be no question about the propriety of animal experimentation.

The opponents of animal experimentation attempt to prejudice the issue by referring to it as vivisection. There is a certain emotional reaction aroused by the idea of cutting up live animals that is unwarranted by the actual facts of the case. The serious scientist does not conduct experiments which are apt to produce pain without the use of anesthetics, except when

it would be absolutely impossible to obtain valuable information in any other way. In almost all experimental work, whatever cutting of tissues is to be done is carried out under adequate anesthesia. Even if it could be shown that in rare instances a scientist has been known to carry out experiments in an unnecessarily painful manner, either by error or by intention, there is no ground for criticizing all experimental biologists by the same token. It is, undoubtedly, true that occasional instances have occurred where a scientist has not observed all due precaution to avoid pain and suffering. These instances are exceedingly rare, however, in proportion to the number of experiments performed by biologists as a whole; and what one should do is perhaps to criticize the individual scientist for his indiscretion; but to condemn the whole practice of animal experimentation on the basis of occasional abuse is as intelligent as it would be to criticize the whole practice of civil government because an occasional officer of law enforcement is unreasonable in his application of law to specific instances. No sane person denies the necessity and value of an ordered society simply because certain agents of an organized society abuse their privileges and power. Neither should one criticize the practice of animal experimentation in the welfare of humanity simply because an occasional individual has been known to carry on unnecessarily painful experiments. It should be emphasized at this point that instances of such indiscretions on the part of biologists are as a matter of fact exceedingly rare, but it cannot be too strongly insisted that there is no one who regrets their occurrence at all any more fully than do the rank and file of biologists themselves.

The activities of the organized groups opposed to animal experimentation are a menace to the progress of science because they would make it impossible for biologists to do any effective experimental work. One is led to inquire as to the motives that prompt the so-called antivivisectionists in their fight against biological work. The antivivisectionists include three major groups. The first are the antimedical bloc; the second are the professional agitators interested in the movement because it affords them a living; and the third are a group of very well intentioned, but misguided, people who support the movement because it claims to be humanitarian, and they are opposed to anything that could be considered to be inhuman or cruel, as the first two groups have portrayed animal experimentation as being.

The antimedical group are the Christian Scientists, the chiropractors, the osteopaths, naturopaths, and those following the other "paths" that are not quite straight and narrow. They are attempting to embarrass medical science by every means, legal and extra-legal, at their command and are using this as one method of achieving their ends. The sane portion of the population will surely never allow this unbalanced group of people to deprive humanity as a whole of the benefits which are accruing and will undoubtedly still accrue in the future from observations on animals.

The second group of professional agitators comprise the paid officials of the various propaganda organizations against biological research. These persons are supported, some of them rather lavishly, by the first group mentioned, and, unfortunately, also by some of the well meaning people in the third group, to be discussed in a moment. Many of these agitators have admitted that they have no interest other than a commercial one in antivivisection propaganda. These paid propagandizers are the most vicious element in the group. They are the lobbyists who attend every session of the state legislature and even of the National Congress, having bills introduced, pulling wires, and altogether exerting as much influence as they can in a political way, to embarrass legitimate biological research.

The third group amongst the rank and file of antivivisectionists is the large number of well meaning, but misinformed, individuals who are led by those who have an axe to grind. It is of this group that we should be particularly solicitous. They are largely people who have simply never been informed about the real situation. They have listened to an inaccurate or exaggerated account of scientific experiments on animals out of the mouths of the promoters, the quacks, and the mentally unbalanced. What these people need is information concerning the realities of the situation. They should be taken to see experimental laboratories. They should be told of the benefits of animal experimentation to mankind. They should be reassured that animal experimentors in science are probably as solicitous of the welfare of animals as any other group of people in the community. The checking of the growth of the power of the antivivisectionist movement depends upon winning these misled people away from their biased, bigoted, and unscrupulous leaders.

Finally, a word should be said about the possibilities for the future of medical science. It would be futile to attempt to predict exactly what lines of investigation will prove fruitful within any specified period of time. There is only one point that it is really worth while to make concerning the future of medical science, namely, that progress is possible only by the further application of the experimental method to its problems. We shall not achieve new successes in the field of medicine comparable to the discovery of insulin, to the conquest of rabies, to an understanding of the methods of control of smallpox and typhoid fever by arm chair research. We have a vast amount of information in the biological sciences which is, at present, uncorrelated, to be sure, but its correlation does not wait for a master mind to put two and two together. Rather, it waits for the filling in of missing links in the structure of our knowledge. It is incomprehensible to scientists who are working in the field that the discoveries which have already been made and applied for human welfare could have been accomplished in quiet contemplation without the use of the experimental method. To be sure, a well reasoned experimental approach is the secret of practical success in scientific work. No scientist would be so blind as to deny the value of logic in the planning of experiments, but anyone who insists upon the superior importance of *a priori* reasoning over observation is simply entirely blind to the whole history of scientific progress. We can look for a ripening of the fruits of scientific labors only by continuing assiduous cultivation of the experimental method.

In summary, I should like to review the ground that I have tried to cover. I have attempted to show, by what has necessarily been a very meager group of examples, the methods by which achievements have been made in biology and medicine. I must apologize for having drawn all of my examples from the realm of physiology. I have chosen to do so only because of my greater familiarity with that field. Equally important examples could be drawn from the field of bacteriology, from pharmacology, or from anatomy. It has seemed obvious that in all of the instances cited the addition bit by bit of observational knowledge has been the basis of scientific progress. I have tried to show that all of this progress has depended upon the use of animals in experimental work, that the sacrifice of animal life to this end is justifiable for the welfare of humanity. Since, in general, the human race has insisted that its interests are paramount to the interests of any other species of animal life, there seems to be no question but that a sacrifice of animals for the increase of scientific knowledge is entirely justifiable on ethical grounds. Until the population at large becomes vegetarian and forgoes the use of animals for all domestic and

commercial uses, the scientist should not be required to justify his use of animals for the welfare of humanity. I have tried to call attention to the menace of the organized vivisectionist movement, and I have pointed out the ulterior motives animating a large share of the people back of this movement. Finally, I have stressed the importance of continued animal experimentation in furthering medical discovery. I hope that I have made clear how intimately the progress of biological knowledge is connected with the employment of the experimental method which is in jeopardy by virtue of the activities of the antivivisectionists. The future of animal experimentation is the future of biological science, and it behooves those who are interested in the latter to foster, encourage and protect the former.

PSYCHIATRY IN THE CRIMINAL COURTS OF COOK COUNTY*

BY

HARRY R. HOFFMAN, M. D.

Director, Behavior Clinic of the Criminal Court of Cook County

Report for the Fiscal Year, 1933

Organization.—The Behavior Clinic of the Criminal Court of Cook County, which came into existence April 1, 1931, is essentially a diagnostic clinic, giving advisory psychiatric service to the Judges of the Criminal Court. The Clinic is disinterested in the legal aspect of the cases referred for examination. Its aim is the intensive study of the individual offender—his mental, physical and emotional make-up—his environment, and the interaction of that individual and that environment. It is hoped that such a scientific study will make for a better understanding of criminals and the forces motivating anti-social behavior and thus help to combat the menace of crime to society.

Scope and Method.—A psychiatric examination may be availed for any offender whom the presiding judge sees fit to have examined. Requests for examinations are made for numerous reasons, the most frequent of which are: 1) to determine the sanity of the individual; 2) to determine his intellectual capacity; 3) to determine his suitability for probation.

Every patient referred to the Behavior Clinic is given several types of examination: 1) a psychological examination by the psychologist to ascertain his mental ability and to determine what can be expected of him in terms of social and industrial adjustment; 2) a comprehensive social history of the patient from relatives, friends, other agencies and individuals who have had contact with him, to learn all the pertinent facts concerning his family background, early life history, later experiences, and a detailed study of his environment in an effort to arrive at a more thorough understanding of the patient in view of his background; 3) a physical examination with special attention to constitutional and neurological defects when such an examination appears necessary; 4) a psychiatric examination by the psychiatrist: (a) to evaluate the personality manifestations of the person; (b) to coordinate all findings and from them make a report to the judge for use in determining the disposition of the case.

Before the hearing copies of the psychiatric examination and conclusions are sent simultaneously to the presiding judge, State's Attorney, and attorney for the defense. After legal disposition of the case copies of the psychiatric, psychological and social service reports are sent to the institution to which the patient is committed or sentenced, or to the Adult Probation Department should he be granted probation.

Referrals.—Since the Clinic's inception 790 cases have been referred for examination, of which 316 were referred during the fiscal year of 1933, an increase of 3 per cent over the number of referrals in 1932. Of these, 302 cases received the routine psychiatric and psychological examinations and

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intensive social service investigations; 2 were given physical examinations only upon order of the presiding judge; 10 either refused examination or were discharged before the psychiatrist could see them; 2 have not yet been examined.

Diagnoses.—Sixteen per cent of those examined were found to be actively psychotic and were committed to hospitals for mental diseases. Ten per cent were found to be mentally defective to an extent warranting commitment to an institution for the feebleminded. An additional 6 per cent were mentally defective (borderline), but not sufficiently low for commitment. It happens that heretofore in the majority of these cases our findings of feeblemindedness have had necessarily to be disregarded by the Court because of the danger of escape from a hospital for the feebleminded (such as Dixon or Lincoln), and the offender, if found guilty, sentenced to Pontiac or Joliet. However, since the establishment of an institution for the defective delinquents and the passage of new laws by the State Legislature permitting the commitment of such individuals to the Department of Public Welfare, the defective delinquents, so diagnosed by the Behavior Clinic, are being committed to the Department of Public Welfare at the Joliet Penitentiary and from there are transferred to the proper institution. Our findings obviously expedite matters for the Diagnostic Institute at Joliet, for the psychiatrists there accept our findings without further examination and dispose of the prisoners accordingly.

About 8 per cent of those patients examined were found to be suffering from some mental or nervous disturbance or personality defect (psychopathic personality, drug addiction, neurosis, emotional instability, inebriety, epilepsy, ambulatory automatism), but not sufficiently serious to warrant commitment by the Court to a hospital for mental diseases. In most of the cases treatment has been recommended. The remainder were found to be negative, that is, no evidences of organic or functional nervous or mental disease were ascertained.

Sources of Referral.—The cooperation of the Judges and every division of the Criminal Court has not only continued but increased. Despite the change in the judges sitting in the Criminal Court, orders for examination originating directly from the judges has increased. In 1932 approximately 35 per cent of the cases referred to the Behavior Clinic for examination were requested by the judges themselves. In 1933 approximately 50 per cent were requested by the judges. Most of the judges sitting in the Felony Court have referred cases to the Behavior Clinic for examination, and several of the judges from the Boys' Court. A judge of the South Chicago Court referred a boy for examination who was being held in the County Jail awaiting trial in his court. The Public Defender's office has requested examinations in approximately ,16 per cent, and the State's Attorney's office about 5 per cent. The public at large seems to have become more aware of the Clinic's service for 10 per cent of the private counsels for defense have referred cases to us as against 5 per cent of last year. Referrals by members of the patient's family, or friends, has shown a slight increase from 3 per cent of last year to 4 per cent of this year. The jail authorities (the Warden, Assistant Warden, and Jail physician) have referred 6 per cent; other social agencies, including the Bureau of Public Welfare, Criminal Court division, Rural Service and Veterans Service divisions, and the Juvenile Court, about 7 per cent; the Adult Probation Department 2 per cent. In one instance a Federal Probation Officer referred a female drug addict for examination; the Parole Officer of Pontiac Reformatory asked for examinations of two boys on parole whom he had incarcerated in the County Jail for the purpose of examination. (In both instances the boys were found to be psychotic.)

Charges.—Individuals charged with every type of offense from disorderly conduct and vagrancy to incest and murder, have been referred to us for examination. Of the cases referred the largest number were those indicted on sex crimes (32 per cent), including rape (10 per cent of the total number referred), crime vs. children (14 per cent of the total number referred), crime vs. nature, incest, indecent liberties, and contributing to the delinquency of minors. The next largest group were those charged with robbery, (17 per cent), 15 per cent of the cases referred were charged with murder, 13 per cent with burglary, 9 per cent with larceny and 4 per cent with "white collar crimes", such as embezzlement, forgery and confidence game. Among the offenders referred for examination were individuals serving sentence at the County Jail for violation of the Municipal Code on such charges as disorderly conduct, soliciting, vagrancy and non-support. In five instances individuals held in the County Jail for safekeeping while awaiting transportation to Federal prison or other institutions were referred for examination.

Stage of Referral.—Though it was intended that examinations by the Behavior Clinic be made after an individual was convicted of a crime, but not yet sentenced, the majority of the cases (80 per cent) have been referred after indictment, but before conviction; 12 per cent were referred after arrest and before indictment; 3 per cent referred were already serving sentence in the County Jail. The remainder were in the County Jail either on habeas corpus writs, for safekeeping for parole officers, or were prosecuting witnesses.

Additional Services.—The Behavior Clinic performs many services to the Court incidental to its work proper. Sometimes emergency physical examinations have to be made and patients treated. On a few occasions the psychiatrist has had to make home or hospital visits to determine the fitness of an individual to appear in court. Occasionally the psychiatrist is called into court to answer questions involving psychological phenomena.

(1) *Expert Testimony.*—The psychiatrist is called into court to testify regarding a patient's mental condition in cases where a diagnosis of a psychosis (insanity) or feeblemindedness has been made warranting commitment to a State hospital. Thus the Court is saved the expense of paying outside psychiatrists for their testimony, and even more important, eliminates the so-called "battle of alienists", for the findings of the Clinic are, in nearly every case, accepted by the State and the Defense as impartial unbiased conclusions.

In many instances where a patient is found to be suffering from a mental disease he is committed at once to a State hospital upon testimony of the Clinic psychiatrist. Thus, not only are matters expedited, but the County is saved the expense of a trial, the impaneling of a criminal jury, the time of the judge, the prosecution and the defense. And the patient is spared the ordeal of a trial until his sanity is recovered.

The psychiatrist has on several occasions been called by the State's Attorney's office to examine a suspect in a murder case at the time of the inquest, especially where it is anticipated that insanity will be used as a defense. (In the recent Wynekoop case Dr. Hoffman, besides making psychiatric examinations of the chief suspects, Dr. Alice Wynekoop and her son, was present during every interview with all the suspects in the case. During the initial investigation in the State's Attorney's office the psychiatrist was called in to make a psychiatric examination of the Touhy gangsters suspected in a pending kidnapping case).

(2) *Education.*—Frequent informal conferences are held between the psychiatrist and judge or attorney concerning medico-legal problems. It is very encouraging to note the growing interest among the practitioners of

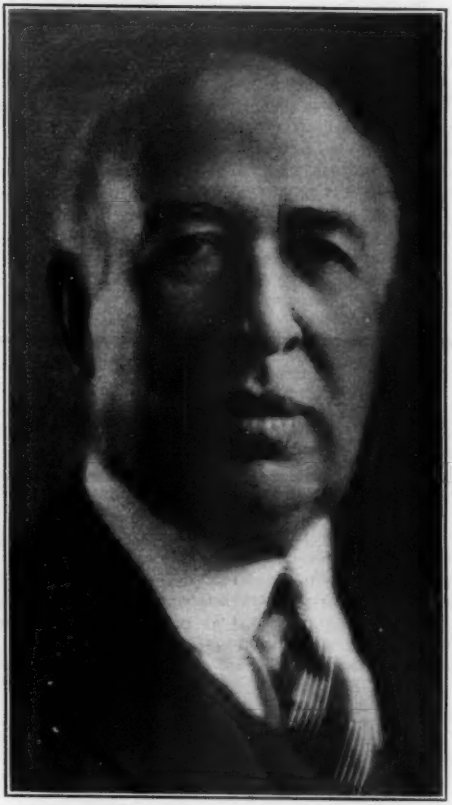
law in the causes of criminal behavior and its treatment, to note the veering away from the old conception of a set punishment for a set offense—a step, we feel, in the right direction.

(3) *Reform.*—Just as after years of discussion in medical, legal and academic circles the Behavior Clinic finally emerged, so too, after much discussion and finally through the concentrated efforts of the Behavior Clinic, an institution for defective delinquents and a radical change in the commitment of that type of offender, have been evolved. Though the need has been long standing, it was not until Dr. Harry R. Hoffman cohesed the general agitation into concrete meetings, committees and potent propaganda, that an amendment to "An Act to better provide for the care and detention of feebleminded persons", was finally passed by the State Legislature. In September, 1933, a theory became an actual reform. By this law defective delinquents are committed directly to the State Department of Public Welfare who in turn, after receiving an intensive psychiatric study at the Diagnostic Depot in Joliet, are classified and committed to the proper institution. In those instances where a patient has been examined by the Behavior Clinic the findings of the Clinic are accepted without further examinations; thus the time and expense of the psychiatric group at the State Penitentiary are saved.

Personnel.—It is intended that all the members of the staff will eventually be placed under Civil Service. Thus far only the supervising psychiatric social worker falls in this category. The psychiatrists were selected by the Chicago Institute of Medicine; the psychologist and medical stenographers were appointed by the Director of the Clinic. The staff as it was originally conceived, consisting of two half time psychiatrists, a full time psychologist, a resident physician, two psychiatric social workers and stenographic service, was barely adequate. With the depleted budget, effective since March, 1932, which eliminated entirely the services of the resident physician and one social worker, and cut the psychologist's services to half time, the Clinic has been working under a handicap, despite which the case load has increased and the service widened, especially since the Courts have become acutely aware of its existence and dependent on its services.

The Behavior Clinic has now been in existence for 32 months. We feel that it has well justified its establishment not only for its work as an advisory psychiatric service to the Courts, nor as an economy measure effecting a savings to the County, but more important, for its inculcation into the spirit of the law and the philosophy of those practicing it, the conception of the offender as a mentally sick individual in need of study and treatment rather than a pariah to be punished according to the heinousness of his offense.

MEMOIRS



ULYSSES SHERMAN GRANT

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1867–1932

Ulysses Sherman Grant, one of the founders of the Illinois State Academy of Science, died in Evanston, Illinois, September 21, 1932. He was then Professor and Head of the Department of Geology and Geography of Northwestern University, a position he had accepted in 1899. He was Vice-President of the State Academy of Science during 1914–1915, and its President in 1915–1916. He was the temporary chairman of the group that founded the Academy in 1907, invariably attended its sessions, and participated in its business and programs with constant energy and interest. In like manner he maintained an active membership in the Chicago Geographic Society, was its First Vice-President for a term of years, and was a member of its Board of Directors at the time of his death.

Professor Grant was born in Moline, Illinois, February 14, 1867. During his undergraduate years at the University of Minnesota he developed an interest in the field of zoology, and in this he held a fellowship there after his graduation in 1888. During later post-graduate work at Johns Hopkins University, however, he transferred his major interest to geology. Attaining his doctorate in 1893, he returned to Minnesota to serve as Assistant State Geologist from 1893 to 1899. During that time he taught in the University of Minnesota for one year. After coming to Northwestern University he was actively associated with the Wisconsin Geological Survey, the United States Geological Survey, the Illinois Geological Survey, and the Oregon Bureau of Mines and Geology. From 1897 to 1904 he was one of the editors of the American Geologist.

Professor Grant's contributions to geological science have ranged over a wide field, but first in his interests was the study of the crystalline rocks. Some of his field studies were made along the International Boundary and in the region lying north of the west end of Lake Superior. It is noteworthy that this same area later became the scene of some of his most effective teaching of field geology. During this early period of creative labor between fifteen and twenty reports appeared in the publications of the Minnesota Geological Survey, the culmination of his studies in this field appearing in Volumes IV and V of the final reports of that Survey.

In 1900, and in closely following years, his studies were directed in part to ore bodies, particularly the lead and zinc ores of southwestern Wisconsin. His mapping of the ore bodies and the accompanying reports are embodied in the Bulletins of the Wisconsin Geological Survey, and in the Lancaster-Mineral Point Folio of the United States Geological Survey. For the latter Survey he was detailed to make an investigation of the ores and crystalline rocks of the vicinity of Prince William Sound and the Kenai Peninsula in Alaska. He visited these regions during three summers and three Bulletins of the United States Geological Survey incorporate the results of his studies.

At Northwestern University Professor Grant's large intellectual caliber and broad sympathies brought him into close relationships both with his colleagues and with students. He served the University on many advisory and administrative committees. On two occasions, one of them during the World War, he was drafted to act as Dean of the College of Liberal Arts. His interest in his students did not terminate with the completion of their classroom work but followed them into later life. None recognizes more keenly than they the value of his competence in teaching and the worth of his friendship.

JOHN PAUL GOODE

JOHN PAUL GOODE

1862–1932

John Paul Goode died on August fifth, 1932, at his summer home at Little Point Sable, Michigan. His brief illness came shortly after the publication of the revised edition of his School Atlas, and his last days were enlivened by letters of congratulation. He remained to the end the happy, enthusiastic personality known to hosts of students and friends.

Professor Goode was born on a farm near Stewartville, Minnesota, November 21, 1862. He graduated from the University of Minnesota in 1889 and accepted a position at the newly-opened normal school at Moorehead where he remained for nine years, doing graduate work at Harvard in 1894 and at the University of Chicago in 1896–97. In 1898 he went to the State Teachers College at Charleston, Illinois, and two years later to the University of Pennsylvania where he received his Ph. D. in geography in 1901 and remained two years as instructor.

In 1903 the University of Chicago established a department of geography under the headship of Rollin D. Salisbury who promptly invited Dr. Goode to an assistant professorship. The presence of these two brilliant scholars and teachers soon attracted a following of both undergraduate and graduate students, and the department grew rapidly. Dr. Goode was advanced to an associate professorship in 1910 and to a professorship in 1917.

Dr. Goode's activities extended far beyond the classroom. He was one of the founders of the Geographic Society of Chicago, served as president for two years and as a director for more than two decades. He was co-editor of the Journal of Geography from 1901 to 1904. In 1908 he made a study of the principal European ports for the Chicago Harbor Commission. In 1909 he was appointed one of the government escorts to the Honorable Commissioners of Japan in their transcontinental tour. Two years later he lectured for the Philippine Government at the Baguio Assembly.

In his later years Dr. Goode gave increasing attention to research and writing. He brought out a set of desk maps and a significant series of physical and political wall maps of the world and of each continent. For years he wrestled with the baffling problem of a map projection of the world on an equal-area basis. He advanced the solution in 1916 with his interrupted homolographic projection and solved the problem in 1923 with his interrupted homolosine projection. These projections represent a basic advance in cartography. In the brief interval since their appearance, they or projections based on them have been used in technical publications of several governments and by practically all important map-making institutions of the world. The climax of Dr. Goode's work is represented in his School Atlas, first published in 1923 and recently revised and enlarged. In it he combined the long experience of a mature geographer with the technical ability of a master cartographer. As a result the Atlas has both scientific and educational distinction.

Professor Goode received many and varied recognitions of his work. His outstanding ability on the lecture platform brought him invitations to speak before Chambers of Commerce, geographic societies, state educational associations, and many other organizations. He served a term as general secretary for the American Association for the Advancement of Science. In 1923 the Geographic Society of Chicago awarded him its Helen Culver Gold Medal for "distinguished achievement in cartography." He was a charter member of the Association of American Geographers, serving as vice-president in 1916 and as president in 1926.

Many students and scientists are indebted to Dr. Goode. He truly was a pioneer in geography, a leader in cartography, and a stimulating influence to his fellow men.

CHARLES C. COLBY